

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
20 November 2003 (20.11.2003)

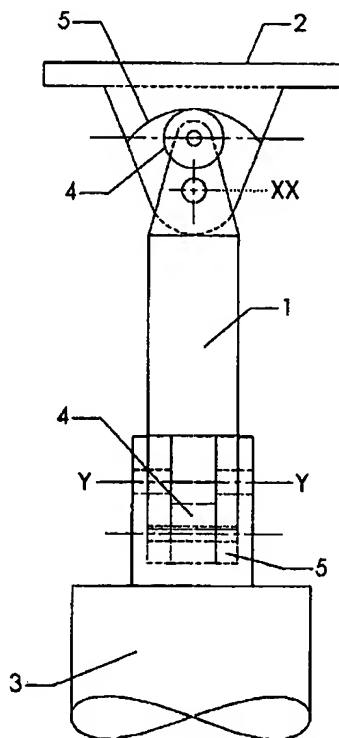
PCT

(10) International Publication Number  
**WO 03/095750 A1**

- (51) International Patent Classification<sup>7</sup>: E02F 5/16, 5/20, 9/24, F16F 11/00, 15/00, 15/023, 15/027, A01B 61/04
- (21) International Application Number: PCT/AU03/00557
- (22) International Filing Date: 9 May 2003 (09.05.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
PS 2239 10 May 2002 (10.05.2002) AU
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- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report

[Continued on next page]

(54) Title: DAMPENING APPARATUS



(57) Abstract: A support structure for a tool (3) such as a post hole borer is provided with means (4, 5) for dampening pendulous movements with respect to a support (2). Dampening may be affected using frictional, compressible or contact devices or a combination of thereof.



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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1

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## **DAMPENING APPARATUS**

### **TECHNICAL FIELD**

This invention relates to dampening apparatus and has  
5 particular relevance to apparatus used for dampening or otherwise controlling  
the movements of elements of equipment and machinery.

### **BACKGROUND ART**

Agricultural and construction equipment and machinery is often  
10 used in situations where the personal safety of operators and others within  
the vicinity of the machinery is of primary importance.

Many types of machinery such as that used for drilling, digging,  
cutting and the like a tool is suspended from a boom arm or other form of  
support.

15 Rotatable auger devices or examples are generally suspended  
from booms and engineered so that the auger can be set up to drill vertical  
holes in required positions despite the fact that the surrounding terrain may  
mean that the vehicle to which the device is attached is not on a level surface.

To accommodate various types of terrains and conditions the  
20 augers are normally suspended so that they are able to freely swing on  
intersecting planes.

When drilling is not taking place and the vehicle or boom arm is  
being moved, the augers can pendulate in a largely uncontrolled manner  
creating a particularly dangerous potential impact situation for the operator  
25 and persons or property nearby.

Drilling augers are not the only types of equipment where tools  
are able to pendulate in a dangerous manner, other examples being pile  
drivers, mowing, lifting, cutting and digging equipment.

It is an object of the present invention to provide a support  
30 structure for a tool where pendulation of the tool with respect to a supporting  
device is controlled and/or inhibited.

Further objects and advantages of the present invention will  
become apparatus from the ensuing description which is given by way of

example.

### DISCLOSURE OF INVENTION

- According to the present invention, there is provided a support
- 5 structure for a tool comprising
- (a) a boom or arm for supporting the tool,
  - (b) a pendulous pivot for supporting the tool with respect to the boom or arm in a manner which allows the tool to pendulate,
  - (c) dampening means for controlling the pendulation of the
- 10 tool on the pivot with respect to the boom or arm characterised in that the dampening is controlled by frictional, compressible or contact devices or a combination of such devices.

- The frictional, compressible or contact devices can be used alone or in combination and may include the use of wheels, opposed
- 15 compressible devices, friction tyres, bearings and the like.

- The support structure can include a boom, a first pivoted link supporting the tool from the boom and enabling it to swing in a first plane and a second pivoted link on a second plane at right angles to the first plane, and dampening means for controlling the pivoting of the tool relative to the boom
- 20 in either plane.

The dampening on a first plane can be provided by a wheel in contact with an asymmetric rail and on a second plane by a wheel in contact with a further asymmetrical rail.

- Dampening can be provided by buffer devices which have
- 25 convoluted shapes arranged in such a manner that when the device is pressed another associated device is stretched.

The pivoted links may include frictional bearings.

- The wheels can have compressible outer sleeves in contact with the rails.
- 30

### BRIEF DESCRIPTION OF THE DRAWINGS

Aspects of the present invention will now be described with reference to the accompanying drawings in which:

Figures 1 and 2 are side views of a dampening apparatus according to one aspect of the present invention, and

Figures 3 and 4 are side views of a dampening apparatus according to another aspect of the present invention.

5           The dampening apparatus illustrated by figures 1 to 4 are alternatives to that described in our International Patent Application no. PCT/AU02/00295 and the positioning and functioning of all apparatus is similar.

          Accordingly, the description in the International Application  
10       should be read in conjunction with the description of the further embodiments herewith.

          With respect to figures 1 and 2 of the drawings, a yoke 1 is pivoted between a support 2 and an object such as a motor gearbox, tool, or implement the like 3.

15           The pivot axis XX:YY intersect at right angles.

          In the example illustrated, the pivoting on axis XX:YY is dampened by wheels 4 in contact with rails 5 attached to the support 2 and an object.

          The wheels 3 may be semi-resilient.

20           As the object 3 pivots on axis X:X the wheels track on the internal surfaces of the rails 5 and because the rails are not symmetrical, the pivoting is restrained.

          Further restraint or dampening may be achieved by the use of resilient wheel treads or rubbers.

25           In a further embodiment of the present invention described by figures 3 and 4 of the drawings, dampening on one plane can be achieved by the use of associated buffers 6 and shock absorbing means 7.

          The set up of the yoke 1 is similar to that described in relation to the figures 1 and 2 embodiments.

30           The buffers 6 may comprise two separate rings of a substantially convoluted configuration each of the rings having mounting apertures 8.

          The yokes pivoting axes XX:YY are shown in figures 3 and 4.

          Pivot pins 9 secure the buffers 6 in a triangular arrangement

with each buffer being secured at one side and together towards the base of the buffers via a lug 10 which extends from the yoke 1.

The buffers are overlapped.

When an object 1 pivots on axis X:X, the lug 10 will pivot to one  
5 side in concert with the pivoting movement.

The buffers 6 are fabricated or moulded in a "memory" material e.g. polyurethane, one buffer will compress and the other will stretch in sympathy with the movement and dampening of the pivoting movement will occur.

10 Pivoting of the object 3 on axis of Y:Y brings the shock absorbing means 7 into play.

The shock absorbing means 7 are fixed to a plate 11 and may be in the form of resilient pads, springs or pistons.

Major elements of the dampening system can be standardised  
15 so that retro-fitting and changes to the actual dampening devices used can be effected in a short time to suit projected uses and for maintenance purposes.

It should be appreciated that the present invention provides a dampening apparatus which is adjustable to control the movements of many different forms of suspended tool whilst they are in an active or inactive state.

20 Apart from the obvious safety advantages of the present invention and its predecessor as described in International Patent Application No. PCT/AU02/00295 the elements of the invention can be interchanged for different applications and uses and readily maintained.

The invention will provide an inexpensive safety facility for a  
25 large range of suspended objects where pendulation is a danger to property and people.

Aspects of the present invention have been described by way of example only and it will be appreciated that modifications and additions thereto may be made without departing from the scope thereof, as defined in  
30 the appended claims.

## CLAIMS:

1. A support structure for a tool comprising
  - (a) a boom or arm for supporting the tool,
  - (b) a pendulous pivot for supporting the tool with respect to
  - 5 the boom or arm in a manner which allows the tool to pendulate,
  - (c) dampening means for controlling the pendulation of the tool on the pivot with respect to the boom or arm characterised in that the dampening is controlled by frictional, compressible or contact devices or a combination of such devices.
- 10 2. A structure as claimed in claim 1 said support structure including a boom, a first pivoted link supporting the tool from the boom and enabling it to swing in a first plane and a second pivoted link on a second plane at right angles to the first plane, and dampening means for controlling the pivoting of the tool relative to the boom in either plane.
- 15 3. A structure as claimed in claim 2 wherein dampening on a first plane is provided by a wheel in contact with an asymmetric rail and on a second plane by a wheel in contact with a further asymmetrical rail.
4. A structure as claimed in claim 2 wherein dampening is provided by buffer devices which have convoluted shapes arranged in such a manner
- 20 that when the device is pressed another associated device is stretched.
5. A structure as claimed in claim 2 wherein the pivoted links include frictional bearings.
6. A structure as claimed in claim 3 wherein the wheels have compressible outer sleeves in contact with the rails.
- 25 7. A support structure substantially as herein described with reference to the accompanying drawings.

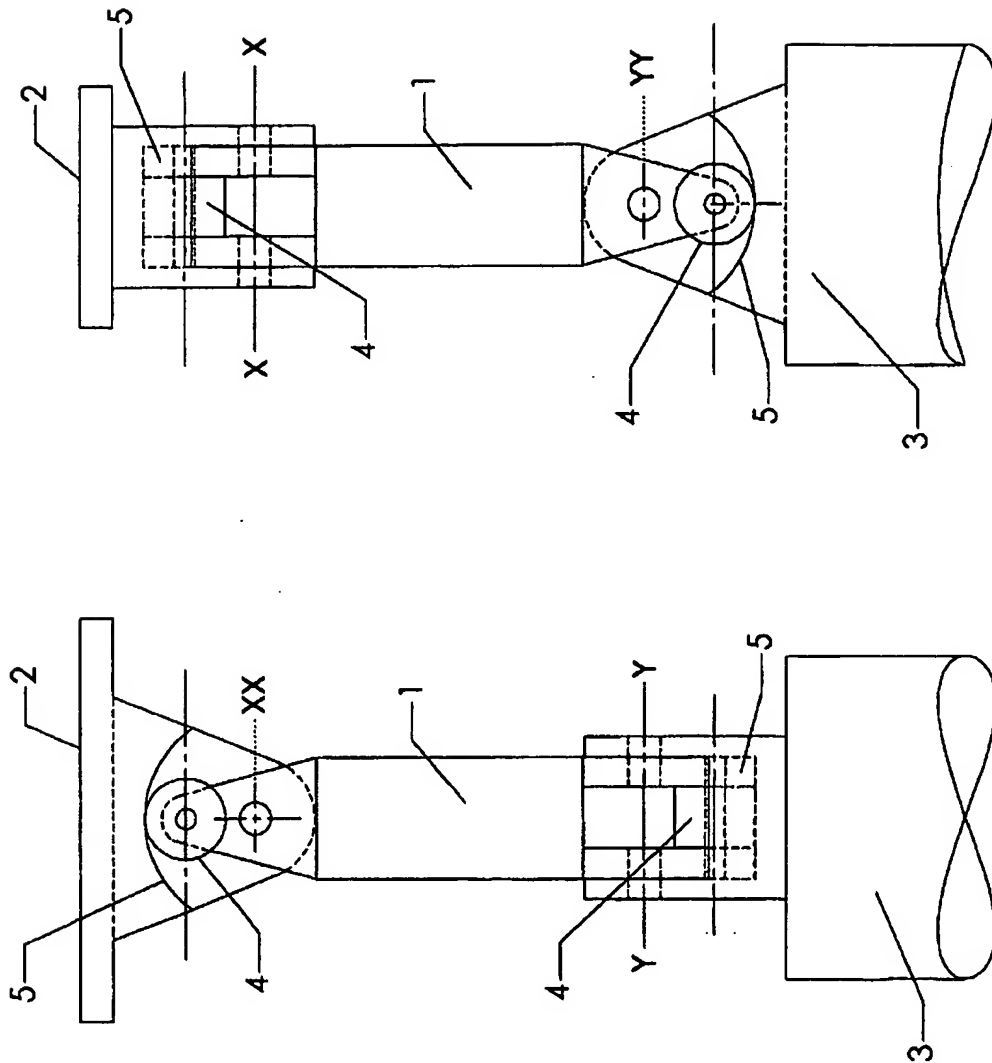


FIG-2-

FIG-1-



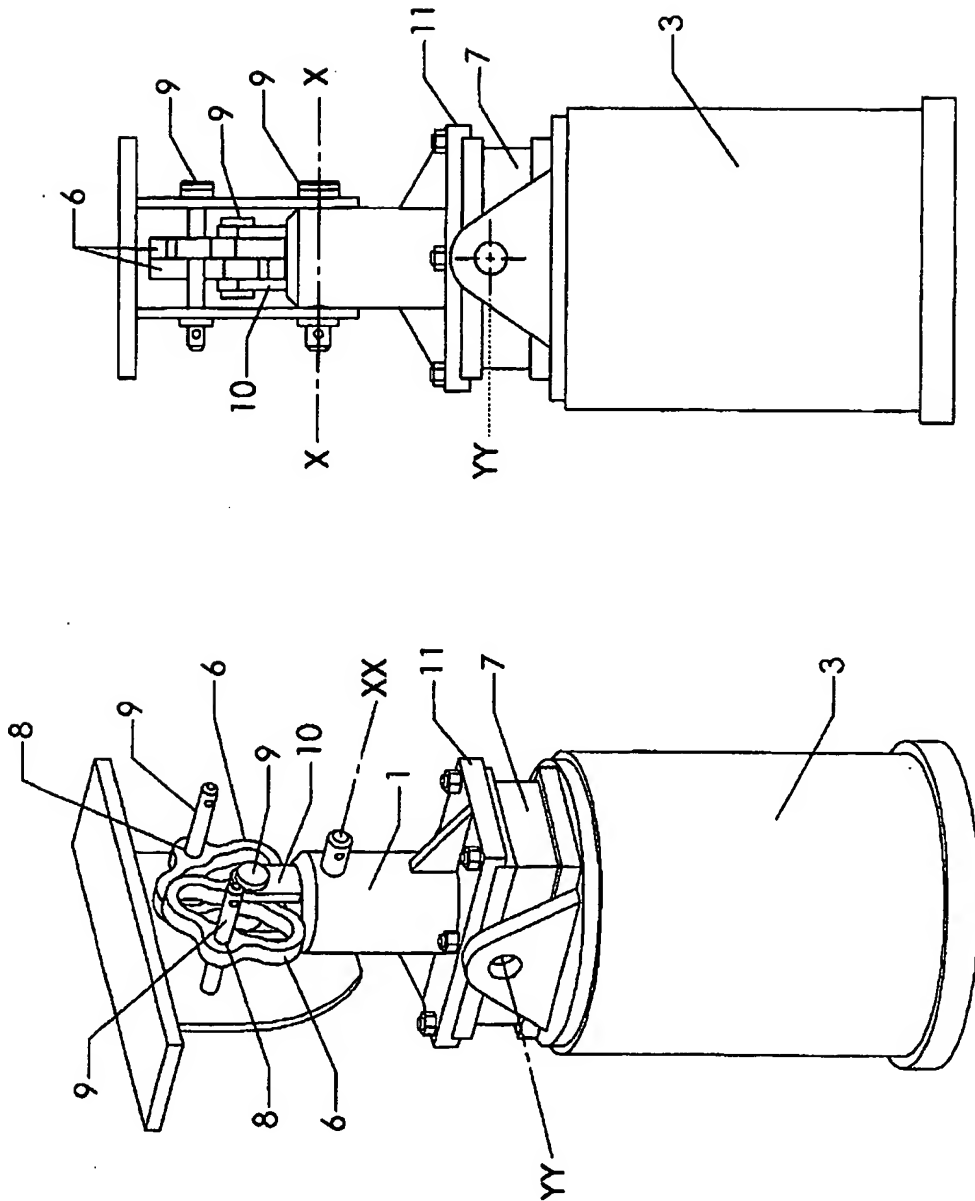


FIG-4

FIG-3

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/AU03/00557

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int. Cl. <sup>7</sup> : E02F 5/16, 5/20, 9/24; F16F 11/00, 15/00, 15/023, 15/027; A01B 61/04		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI: DC: P11, Q63, Q42, Q49 with keywords (pendulous, damp, support)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	WO 02/072964 A1 (WRIGHT) 19 September 2002 Whole document	1-7
X	WO 00/53522 A1 (INDEXATOR AB) 14 September 2000 Whole document	1-6
X	US 5507354 A (HARLEMAN) 16 April 1996 Whole document	1-6
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search 1 July 2003		Date of mailing of the international search report 03 JUL 2003
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929		Authorized officer  ZBIGNIEW BIELAWSKI Telephone No : (02) 6283 2218

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU03/00557

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4735158 A (PAUL ET AL.) 5 April 1988 Whole document	1-6
X	US 4342270 A (LOFGREN ET AL.) 3 August 1982 Whole document	1-6
X	US 4273056 A (LOFGREN ET AL.) 16 June 1981 Whole document	1-6
X	FR 2314435 A (A.R.M.E.F.) 7 January 1977 Whole document	1-6

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/AU03/00557**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
WO	2002072964	AU	20013715		
WO	200053522	AU	200036893	CA	2366291
		SE	9900836	EP	1175368
US	5507354	NONE			
US	4735158	CA	1250185		
US	4342270	CA	1151953	FI	810488
				SE	8004686
US	4273056	CA	1108016	DE	2919962
		SE	7805797	FI	791544
FR	2314435	NONE			
END OF ANNEX					